

CLAIMS

What is claimed is:

1. A disc for use with a recording and/or reproducing apparatus, the disc comprising:
 - a user data area in which user data is recorded;
 - a spare area other than the user data area and which includes a substitute area for a defective area existing in the user data area; and
 - an address area which includes an address of a last data that is last recorded in the user data area and an address of a replacement data recorded in the spare area and which are accessed by the recording and/or reproducing apparatus.
2. The disc of claim 1, further comprising a temporary defect management area which includes temporary defect information and temporary defect management information recorded for each of a plurality of recording operations for use by the recording and/or reproducing apparatus to perform disc defect management,
 - wherein the temporary defect management area includes the address area.
3. The disc of claim 1, further comprising a record layer, wherein the address of data and the address of the replacement area are recorded to correspond to each other in the record layer.

4. The disc of claim 2, wherein at least one of the temporary defect information and the temporary defect management information is repeatedly recorded on the disc.

5. The disc of claim 2, further comprising at least one of a lead-in and a lead-out area other than the user data area and the spare area, wherein the temporary defect management area is formed in the at least one of the lead-in area and the lead-out area.

6. The disc of claim 2, wherein the temporary defect management area further comprises a pointer to a recording position of the temporary defect information.

7. The disc of claim 2, wherein the temporary defect management information is recorded to correspond to the temporary defect information in the temporary defect management area, the temporary defect information being recorded for each of a plurality of recording operations in which the user data is recorded in the user data area.

8. The disc of claim 2, wherein the temporary defect information comprises a defect position pointer that points to a position of a defective area in the user data area and a replacement position pointer that points to a position of the replacement data that replaces a portion of the user data recorded in the defective area.

9. The disc of claim 8, wherein the temporary defect information further comprises state information that specifies a state of the defective area.

10. The disc of claim 9, wherein the state information specifies whether the defect is a continuous defect block extending over more than one block or a single defect block.

11. The disc of claim 9, wherein the state information specifies that the defective area is in a continuous defect block extending over more than one block, and the corresponding defect position pointer and replacement position pointer indicate a start position of the defective area and a start position of the replacement data, respectively.

12. The disc of claim 9, wherein the state information specifies that the defective area is in a continuous defect block extending over more than one block, and the corresponding defect position pointer and replacement position pointer indicate an end position of the defective area and an end position of the replacement data, respectively.

13. The disc of claim 1, further comprising a defect management area that is formed in at least one of the lead-in area and the lead-out area,

wherein the defect management area further comprises a last recorded temporary defect information and a last recorded temporary defect management information recorded as defect information and defect management information, respectively, during finalization of the disc, and

the last recorded temporary defect information and the last recorded temporary defect management information comprise the temporary defect information and the temporary defect management information last recorded in the temporary defect management area.

14. The disc of claim 13, further comprising a plurality of the defect management areas.

15. A method of managing a defect in a disc, the disc comprising a user data area and a spare area other than the user data area, the method comprising:

recording user data in the user data area;

again recording the user data, which is recorded in a defective area of the user data area in which a defect exists, in the spare area so as to make replacement data for the user data recorded in the defective area; and

recording an address of a last user data, which is last recorded in the user data area, and an address of a last replacement data, which is recorded in the spare area, in a temporary defect management area that is on the disc to perform disc defect management.

16. The method of claim 15, wherein the recording the addresses further comprises recording the address of last recorded data and the address of last recorded replacement data to correspond to each other in a record layer of the disc.

17. The method of claim 15, wherein the recording the addresses further comprises recording the address of the last recorded data and the address of the last recorded replacement data as temporary defect information in the temporary defect management area.

18. The method of claim 17, wherein the recording the addresses further comprises repeatedly recording the temporary defect information.

19. The method of claim 17, wherein the recording the addresses further comprises recording in the temporary defect information a defect position pointer that points to a defective area and a replacement position pointer that points to the position of the replacement data.

20. The method of claim 17, wherein the recording the addresses further comprises recording in the temporary defect information state information that specifies a state of the defective area.

21. The method of claim 20, wherein the recording the addresses further comprises recording in the state information block information that specifies whether the defective area is a continuous defect block extending over more than one block or a single defect block.

22. The method of claim 21, wherein the recording the addresses further comprises recording in the block information that specifies that the defective area is in the continuous defect block, and a corresponding defect position pointer and a replacement position pointer to indicate a start position of the defect and a start position of the replacement data, respectively.

23. The method of claim 21, wherein the recording the addresses further comprises recording in the block information that specifies that the defective area is the continuous defect block, a corresponding defect position pointer and a replacement position pointer to indicate an end position of the defective area and an end position of the replacement data, respectively.

24. A recording and/or reproducing apparatus for use with a disc having a user data area, a temporary defect management area, and a spare area other than the user data area, the apparatus comprising:

a recording/reading unit that records data on or reads data from the disc; and

a controller that controls the recording/reading unit to

record user data in the user data area of the disc,

again record user data that was recorded in a defective area of the user data area in the spare area so as to make replacement data for the user data recorded in the defective area, and

record an address of last data, which is last recorded in the user data area, and an address of last replacement data, which is last recorded in the spare area, in the temporary defect management area that is used by the apparatus to perform disc defect management with respect to the disc.

25. The recording and/or reproducing apparatus of claim 24, wherein the controller further controls the recording/reading unit to record the address of last the last recorded data and the address of the last recorded replacement data in a record layer of the disc so that the addresses correspond to each other.

26. The recording and/or reproducing apparatus of claim 24, wherein the controller further controls the recording/reading unit to record the address of the last recorded data and the address of the last recorded replacement data in a record layer of the disc as temporary defect information in the temporary defect management area.

27. The recording and/or reproducing apparatus of claim 26, wherein the controller further controls the recording/reading unit to repeatedly record the temporary defect information on the disc.

28. The recording and/or reproducing apparatus of claim 26, wherein the controller further controls the recording/reading unit to record in the temporary defect information a defect position pointer that points to a defective area and a replacement position pointer that points to a position of the replacement data.

29. The recording and/or reproducing apparatus of claim 26, wherein the controller further controls the recording/reading unit to record in the temporary defect information state information that specifies a state of the defective area.

30. The recording and/or reproducing apparatus of claim 29, wherein the controller further controls the recording/reading unit to record in the state information block information that specifies whether the defective area is a continuous defect block extending over more than one block or a single defect block.

31. The recording and/or reproducing apparatus of claim 29, wherein the controller further controls the recording/reading unit to record in the state information block information specifying that the defective area is a continuous defect block extending over more than one block, and a corresponding defect position pointer and a replacement position pointer to indicate a start position of the defective area and a start position of the replacement data, respectively.

32. The recording and/or reproducing apparatus of claim 29, wherein the controller further controls the recording/reading unit to record in the state information block information specifying that the defect is a continuous defect block extending over more than one block, and a corresponding defect position pointer and a replacement position pointer to indicate an end position of the defective area and an end position of the replacement data, respectively.

33. The disc of claim 1, wherein the disc is a write-once storage medium having a property which prevents, after the data is recorded on an area of the disc, new data from being written to the area of the disc.

34. The method of claim 15, wherein the disc is a write-once storage medium having a property which prevents, after the data is recorded on an area of the disc, new data from being written to the area of the disc.

35. The recording and/or reproducing apparatus of claim 24, wherein the disc is a write-once storage medium having a property which prevents, after the data is recorded on an area of the disc, new data from being written to the area of the disc.

36. A storage medium for use with a recording and/or reproducing apparatus, the storage medium comprising:

a user data area in which user data is recorded, the user data area comprising a first defective area; and

a management area other than the user data area and which includes a first temporary defect information area corresponding to the first defective area and comprising first temporary defect information regarding the first defective area and a copy of the first temporary defect information that consists of the first temporary defect information,

wherein the management area is accessed by the recording and/or reproducing apparatus to perform defect management.

37. The storage medium of claim 36, wherein:

the user data area further comprises a second defective area,

the management area further comprises a second temporary defect information area corresponding to the second defective area and comprising second temporary defect information regarding the second defective area and a copy of the second temporary defect information that consists of the second temporary defect information.

38. The storage medium of claim 37, wherein:

the second temporary defect information comprises the first temporary defect information and information regarding the second defective area, and

the first temporary defect information does not include information regarding the second defective area.

39. The storage medium of claim 38, further comprising a defect management area other than the user data area and which includes the second temporary defect information.

40. The storage medium of claim 36, wherein the management area further comprises a first temporary defect management information area corresponding to the first temporary defect information area and comprising first temporary defect management information regarding the first temporary defect information and a copy of the first temporary defect management information that consists of the first temporary defect management information.

41. The storage medium of claim 40, wherein:
the first temporary defect management information comprises a pointer to a position of the first temporary defect information, and
the first temporary defect information comprises a pointer to a position of the first temporary defect.

42. The storage medium of claim 41, further comprising a spare area other than the user data area and which comprises first replacement data replacing a portion of the user data recorded in the first defective area,

wherein the first temporary defect information further comprises a pointer to a position of the first replacement data.

43. The storage medium of claim 42, wherein the first temporary defect management information further includes an address of the first replacement data, and an address of a last portion of the user data to be recorded prior to recording of the first temporary defect management information.

44. The storage medium of claim 36, wherein the storage medium is a write-once storage medium having a property which prevents, after the data is recorded on an area of the disc, new data from being written to the area of the storage medium.

45. A storage medium for use with a recording and/or reproducing apparatus, the storage medium comprising:

a user data area in which user data is recorded in blocks, the user data area comprising a first defective area; and

a management area other than the user data area and which includes a first temporary defect information area corresponding to the first defective area and comprising first temporary defect information regarding the first defective area usable by the recording and/or reproducing apparatus to perform defect management,

wherein the first temporary defect information comprises first state information which differentiates between and indicates whether the first defective area is a first block type comprising a first number of the blocks or a second block type consisting of less than the first number of the blocks.

46. The storage medium of claim 45, wherein the management area further comprises first temporary defect management information comprising a pointer to a position of the first temporary defect information, and

the first temporary defect information further comprises a pointer to a position of the first temporary defect.

47. The storage medium of claim 46, further comprising a spare area other than the user data area and which comprises first replacement data replacing a portion of the user data recorded in the first defective area,

wherein the first temporary defect information further comprises a pointer to a position of the first replacement data.

48. The storage medium of claim 47, wherein the first temporary defect management information further includes an address of the first replacement data, and an address of a last portion of the user data to be recorded prior to recording of the first temporary defect management information.

49. The storage medium of claim 48, wherein:

the user data area further comprises a second defective area other than the first defective area,

the spare area further comprises second replacement data replacing a portion of the user data recorded in the second defective area,

the management area further comprises a second temporary defect information area corresponding to the second defective area and comprising second temporary defect information regarding the second defective area and second temporary defect management information regarding the second temporary defect information, and

the second temporary defect information comprises the first temporary defect information, second state information which differentiates between and indicates whether the second defective area is the first type block or the second type block, a pointer to the second defective area, and a pointer to the second replacement data.

50. The storage medium of claim 49, wherein the first state information is one of the first type block and the second type block, and the second state information is the other one of the first type block and the second type block.

51. The storage medium of claim 45, wherein the storage medium is a write-once storage medium having a property which prevents, after the data is recorded on an area of the storage medium, new data from being written to the area of the storage medium.

52. A computer readable medium encoded with processing instructions for implementing a method of managing a defect in a storage medium performed by a computer, the method comprising:

transferring user data with respect to a user data area of the storage medium, the user data area comprising a first defective area with respect to which a first portion of the user data is transferred;

transferring first replacement data comprising the first portion of the user data with respect to a spare area of the storage medium other than the user data area; and

transferring first management information with respect to a management area of the storage medium so as to manage the user data and the first replacement data, the first management information comprising an address of the first replacement data and an address of a last portion of the user data to be recorded on the storage medium prior to creation of the first management information.

53. The computer readable medium of claim 52, wherein the first management information further comprises:

first defect information comprising a pointer to the first defective area and a pointer to the first replacement data, and

first defect management information comprising a pointer to the first defect information, the address of the last portion of the user data, and the address of the first replacement data.

54. The computer readable medium of claim 52, wherein:

if the storage medium is not to be finalized, the transferring the first management information comprises transferring the first management information with respect to a temporary defect management area,

if the storage medium is to be finalized, the transferring the first management information comprises transferring the first management information with respect to a defect management area, and

the defect management area is other than the temporary defect management area.

55. The computer readable medium of claim 52, wherein:

the user data is recorded in blocks,

the first defect information further comprises state information indicating and differentiating between a first block type and a second block type, and

the transferring the first management information further comprises,

if the state information indicates the first block type, determining that the first defective area comprises a first number of continuous blocks, and

if the state information indicates the second block type, determining that the first defective area consists of a second number of blocks which is less than the first number of blocks.

56. The computer readable medium of claim 52, wherein the transferring the first management information comprises recording in a first temporary management area the first management information and a copy of the first management information consisting of the first management information.

57. The computer readable medium of claim 52, wherein the storage medium is a write-once storage medium having a property which prevents, after the data is recorded on an area of the storage medium, new data from being written to the area of the storage medium.

58. A recording and/or reproducing apparatus for use with a storage medium having a user data area, a temporary defect management area, and a spare area other than the user data area, the apparatus comprising:

a pickup unit that transfers user data with respect to the user data area, the user data area comprising a first defective area; and

a controller that determines an available portion of the user data area and the spare area using a first address and a second address and controls the pickup unit to

transfer the user data with respect to the user data area,

transfer first replacement data with respect to the spare area, the first replacement data comprising a portion of the user data that was recorded in the first defective area, and

transfer first management information with respect to the management area, the first management information being used by the controller to manage the user data and the first replacement data and comprising the first address comprising an address of the first replacement data and the second address comprising an address of a last portion of the user data to be recorded in the user data area prior to creation of the first defect information.

59. The recording and/or reproducing apparatus of claim 58, wherein the first management information further comprises:

first defect information comprising a pointer to the first defective area and a pointer to the first replacement data, and

first defect management information comprising a pointer to the first defect information, the address of the last portion of the user data, and the address of the first replacement data.

60. The recording and/or reproducing apparatus of claim 58, wherein:

if the storage medium is not to be finalized, the controller controls the pickup unit to transfer the first management information with respect to a temporary defect management area of the management area,

if the storage medium is to be finalized, the controller controls the pickup unit to transfer the first management information with respect to a defect management area of the management area, and

the defect management area is other than the temporary defect management area.

61. The recording and/or reproducing apparatus of claim 58, wherein:

the user data is recorded in blocks,

the first defect information further comprises state information indicating and differentiating between a first block type and a second block type, and

the controller further,

if the state information indicates the first block type, determines that the first defective area comprises a first number of continuous blocks, and

if the state information indicates the second block type, determines that the first defective area consists of a second number of blocks which is less than the first number of blocks.

62. The recording and/or reproducing apparatus of claim 58, wherein the controller further controls the pickup unit to record in a first temporary management area the first management information and a copy of the first management information consisting of the first management information.

63. The recording and/or reproducing apparatus of claim 58, wherein the storage medium is a write-once storage medium having a property which prevents, after the data is recorded on an area of the storage medium, new data from being written to the area of the storage medium.